REMARKS

Upon entry of the present amendment, claims 6 and 7 will have been canceled, without prejudice and without disclaimer of the subject matter. Claims 2-5 and 8-12 will have been amended to correct informalities in the claim language and to more clearly define the invention, while not substantially affecting or narrowing the scope of these claims, and claim 1 will have been amended to recite that the distortion corrector includes a distortion estimator that estimates the distortion and outputs a correcting signal based on an inverse distortion characteristic of the receiver, and a distortion compensator that multiplies the received signal and the correcting signal to remove the non-linear distortion from the received signal. Applicant respectfully submits that all pending claims are now in condition for allowance.

Further, upon entry of the present amendment, claims 13-20 will have been submitted for the Examiner's consideration. Independent claim 13 is directed to the embodiment of the invention in which a non-linear quantizer converts the received signal to a non-linear quantized signal. Claim 8-12 have been amended to depend, directly or indirectly, from new claim 13. Claim 14 depends from claim 13 and recites the distortion correction. Claims 15 and 16 depend from claim 11 and recite types of code systems, generally identified in claim 11. Claims 17 and 18 depend from claims 1 and 13, respectively, and recite that the received signal on which the reception processing is performed includes an instantaneous signal. Claims 19 and 20 are method claims that recite an embodiment of the invention for removing non-linear distortion from a received signal.

In the above-referenced Official Action, the Examiner objected to the abstract of the invention as being too long (i.e., exceeding 150 words) and to the title of the invention as not being sufficiently descriptive. Further, the Examiner objected to a number of minor informalities in the claim language of claims 1, 3-5 and 9-12. Applicant has provided herein a new Abstract and Title of the invention to replace the original Abstract and Title. Applicant has also amended the referenced claims. Accordingly, Applicant respectfully submits that the Examiner's objections are now moot.

With respect to patentability, the Examiner rejected claims 6 and 12 under 35 U.S.C. § 112, first paragraph, as containing subject matter that is not described in the specification in such a way as to enable one skilled in the relevant art to make and/or use the invention. Applicant respectfully submits that the Examiner's rejection is improper, at least for the reasons set forth below. The Examiner also rejected claims 9-12 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicant respectfully submits that the Examiner's rejection is moot in view of the amendments to claims 9-12.

Further, the Examiner rejected claims 1-5 under 35 U.S.C. § 102(b) as being anticipated by BAIER et al. (U.S. Patent No. 5,375,255). The Examiner rejected claims 1, 3, 5, 7 8 and 11 under 35 U.S.C. § 102(b) as being anticipated by TANAKA et al. (U.S. Patent No. 4,800,574). The Examiner rejected claims 1, 5 and 6 under 35 U.S.C. § 102(b) as being anticipated by LEGRAND et al. (U.S. Patent No. 4,446,646). The Examiner rejected claims 1 and 7-11 under 35 U.S.C. § 102(b) as being anticipated by ARENS et al. (U.S. Patent No. 5,301,364). The Examiner rejected claims 1 and 5 under

35 U.S.C. § 102(e) as being anticipated by ICHIHARA (U.S. Patent Application Publication No. 2003/0086513). The Examiner has rejected claims 7, 11 and 12 under 35 U.S.C. § 102(e) as being anticipated by ICHIHARA in view of HELLBERG (U.S. Patent No. 6,3376,885). The Examiner has rejected claims 8-10 under 35 U.S.C. § 103(a) as being unpatentable over ICHIHARA in view of HELLBERG, in further view of ARENS et al. Applicant respectfully traverses these rejections, at least for the reasons stated below.

Generally, the embodiment of the present invention as claimed in amended claim 1 (as well as newly submitted claim 14) is disclosed as being directed to, e.g., a digital reception apparatus that includes a distortion corrector for removing distortion introduced by the receiver portion of the apparatus, which renders the received signal non-linear. The distortion corrector removes the non-linear distortion and thereby enables the signal to be processed by a conventional demodulator. The distortion corrector includes a distortion estimator that estimates the distortion and outputs a correcting signal based on an inverse distortion characteristic of the receiver, and a distortion compensator that multiplies the received signal and the correcting signal to remove the non-linear distortion from the received signal. The distortion compensator outputs a corrected (i.e., linear) received signal. *See, e.g.,* p. 8, lines 5-17; p. 9, lines 1-10. An advantage of the invention is that it corrects instantaneous signals, as opposed to a series of signals, as in an equalization process. *See* p.10, line 1.

Applicant respectfully submits that the Examiner's rejections under 35 U.S.C. § 112, first paragraph, appear to be incorrect. With respect to linear versus non-linear quantization, quantizing sections 302, 401 and 602, indicated in the embodiments

depicted in Figs. 3-6 of the application, actually perform linear quantization, but introduce a non-linear distortion in the process, resulting in a non-linear output. This non-linear distortion is subsequently removed by the distortion correcting section 303, 202 and 603, respectively, resulting in a linear signal being demodulated, e.g., as recited in claim 5.

In contrast, quantizing section 901, indicated in the embodiments depicted in Figs. 9 and 12-16, actually performs non-linear quantization, resulting in a non-linear quantized signal, regardless of distortion. For example, the specification states that the "received signal ... is coded in non-linearly quantizing section 901 to be a non-linear quantized coded signal 950." *See* p. 76, lines 21-23. The non-linear signal is made linear by a linear compensating section (e.g., 902, 1203). Notably, however, a non-linear distortion may also be added to the signal during this non-linear quantization process, which can be corrected. For example, the specification states that "when a distortion is generated in an element in the receiving section, linearly compensating section 902 needs to perform the compensation considering the distortion generated in the element besides the non-linearity of non-linearly quantizing section 901." *See* p.86, line 26 - p. 87, line 4. This embodiment of the invention, i.e., distortion correction on a non-linear quantized signal, is claimed in new claims 13 and 14.

Accordingly, Applicant respectfully submits that the specification adequately describes the subject matter in such a way as to enable one skilled in the relevant art to make and/or use the claimed embodiments of the invention, and therefore requests the Examiner withdraw the rejection under 35 U.S.C. § 112, first paragraph.

With respect to the prior art rejections, Applicant respectfully submits that the numerous references cited by the Examiner are distinguishable over the claimed embodiments of the present invention. For example, BAIER et al. appear to teach equalizing a received signal in order to remove a distortion introduced by dynamic compression in an amplifier. *See* col. 4, lines 30-37. However, the present application specifically distinguishes over such an equalization process, focusing instead non-linear processing of instantaneous signals. *See* p.9, line 11 - p.11, line 2. Further, the equalization process of BAIER et al. does not include a distortion estimator that estimates a distortion of a received signal and outputs a correcting signal, based on an inverse distortion characteristic of the receiver, or a distortion compensator that multiplies the received signal and the correcting signal to remove the non-linear distortion from the received signal, as claimed in claims 1, 14 and 19. Therefore, BAIER et al. do not disclose each and every element of Applicant's claimed invention, and withdrawal of the rejections of claims 1-5 under 35 U.S.C., § 102(b) is respectfully requested.

The Examiner specifically relied on Figs. 12 and 16 of TANAKA et al. to teach the claimed invention. However, Fig. 12 depicts a digital modem that includes a non-linear AD converter 512, having a non-linear characteristic, which outputs 8-bit digital received data to a CPU 500. *See* col. 10, lines 1-9. The CPU 500 appears to compensate for the non-linearity by expanding one byte of signal supplied by the DA converter 512 to ten and several bits of signal having linear levels. *See* col. 10, lines 19-30. Assuming this is the disclosed process of removing non-linear distortion on which the Examiner relies, it is clearly distinguishable from the present invention, which does not correct for non-linear distortion by expanding data. With respect to Fig. 16, a non-linear to linear

converter is shown (with no reference number) in a signal processor in a demodulation mode, but there is no discussion whatsoever of how this conversion is performed. *See* col. 10, line 57 - col. 11, line 7. Therefore, TANAKA et al. do not disclose each and every element of Applicant's claimed invention, and withdrawal of the rejections of claims 1, 3, 5, 7, 8 and 11 under 35 U.S.C., § 102(b) is respectfully requested.

LEGRAND et al. is directed to an airborne Tacan system that receives bearing information. Fig. 2 indicates a linear analog to digital converter 16, having an output to a digital computer 17 that incorporates an antilog routine 19. However, LEGRAND et al. do not include a distortion estimator that estimates a distortion of a received signal and outputs a correcting signal, based on an inverse distortion characteristic of the receiver, or a distortion compensator that multiplies the received signal and the correcting signal to remove the non-linear distortion from the received signal, as claimed in claims 1, 14 and 19. Therefore, LEGARD et al. do not disclose each and every element of Applicant's claimed invention, and withdrawal of the rejections of claims 1, 5 and 6 under 35 U.S.C., § 102(b) is respectfully requested.

ARENS et al. disclose a method for automatic gain control (AGC) in a receiver, which includes a lookup table that incorporates all of the receiver characteristics and non-linearities, including A/D conversion non-linearities. *See* col. 5, lines 49-52. However, ARENS et al. appear to determine a difference in power (which populate the lookup table) between the power seen at the AD converter and the desired power, in order to enable the AGC and to obtain an appropriate power estimate of a faded signal. *See* col. 6, lines 2-14. This differs from removing a receiver induced distortion using the inverse distortion characteristics, as claimed in the present invention. Therefore, ARENS et al.

do not disclose each and every element of Applicant's claimed invention, and withdrawal of the rejections of claims 1 and 7-11 under 35 U.S.C., § 102(b) is respectfully requested.

ICHIHARA is also directed to an AGC circuit that calculates the average received level per slot to correct a variation in received level. The Examiner relied on Fig. 1, representing a conventional AGC circuit, which includes a linearizer 12 that corrects nonlinearity of the control voltage/gain characteristics of an AGC amplifier 2. *See* para. [0037]. However, as in Fig. 16 of TANAKA et al. above, there is no discussion of how this conversion is performed. In fact, ICHIHARA merely states that, since the linearizer 12 is not directly associated with the invention, it will not be described. *See* para. [0037]. Therefore, ICHIHARA et al. do not disclose each and every element of Applicant's claimed invention, and withdrawal of the rejections of claims 7, 11 and 12 under 35 U.S.C., § 102(e) is respectfully requested.

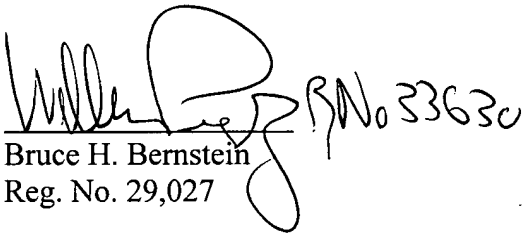
With respect to claims 8-10, the Examiner relied on HELLBERG and ARENS et al. in combination with ICHIHARA for the rejections under 35 U.S.C. 103(a). However, the Examiner relied on HELLBERG only to teach a calculator and ARENS et al. only to teach converting a non-linear signal generated by a quantizer into a linear signal using a quantization characteristic of the quantizer (addressed above). Therefore, HELLBERG and ARENS et al. do not overcome the deficiencies of the primary reference.

In view of the herein contained amendments and remarks, Applicant respectfully requests reconsideration and withdrawal of previously asserted rejections set forth in the Official Action of May 13, 2004, together with an indication of the allowability of all pending claims, in due course. Such action is respectfully requested and is believed to be appropriate and proper.

Any amendments to the claims in this Reply, which have not been specifically noted to overcome a rejection based upon the prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to attach thereto.

Should the Examiner have any questions concerning this Amendment or the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully Submitted,
Masayuki ORIHASHI



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